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The fiscal impact of informal caregiving to home care recipients in Canada: How the intensity of care influences costs and benefits to government

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ABSTRACT

The objective of this study was to estimate the annual costs and consequences of unpaid caregiving by Canadians from a government perspective. We estimated these costs both at the individual and population levels for caregivers aged 45 and older. We conducted a cost-benefit analysis where we considered the costs of unpaid caregiving to be potential losses in income tax revenues and changes in social assistance payments and the potential benefit of reduced paid care expenditures. Our costing methods were based on multivariate analyses using the 2007 General Social Survey, a cross-sectional survey of 23,404 individuals. We determined the differential probability of employment, wages, and hours worked by caregivers of varying intensity versus non-caregivers. We also used multivariate analysis to determine how receiving different intensities of unpaid care impacted both the probability of receiving paid care and the weekly hours of paid care received. At the lowest intensities of caregiving, there was a net benefit to government from caregiving, at both the individual and population levels. At the population level, the net benefit to government was estimated to be $4.4 billion for caregivers providing less than five hours of weekly care. At the highest intensity of caregiving, there was a net cost to government of $641 million. Our overall findings were robust to a number of changes applied in our sensitivity analysis. We found that the factor with the greatest impact on cost was the probability of labour force participation. As the biggest cost driver appears to be the higher likelihood of intense caregivers dropping out of the labour force, government policies that enable intense caregivers to balance caregiving with employment may help to mitigate these losses.

Introduction

There has been significant discussion surrounding the benefits and costs of unpaid caregiving (Barrett, 2008; Hollander & Chappell, 2002; Hollander, Liu, & Chappell, 2008; Lilly, Laporte, & Coyte, 2010). With an ageing population, the alternative to at-home unpaid caregiving is expensive and probably not supportable at current government budget levels. Despite the considerable debate about the government's role in providing paid home care in Canada, there have been no economic evaluations conducted of the impact of unpaid caregiving from a government's perspective. Yet this is a critical component of the debate.

The importance of such a contribution is highlighted by findings of recent literature. In a 2007 review of the existing literature on caregiving and labour force outcomes, Lilly, Laporte, and Coyte found that, while the majority of caregivers experienced limited labour supply repercussions, high intensity caregivers were much more likely to be out of the labour market than lower intensity caregivers or non-caregivers. These findings have been mirrored in subsequent research which has found intensity effects on the likelihood of caregivers' labour supply and outcomes in Europe (Carmichael & Charles, 2003; Crespo, 2007; Drinkwater, 2011; Hassink & Van den Berg, 2011; Heitmueller, 2007), North America (Lilly et al., 2010; Pyper, 2006), and Australia (Berecki-Gisolf, Lucke, Hockey, & Dobson, 2008). Most recently, a related project uncovered similar findings for the Canadian context (Lilly, Jacobs, Ng, & Coyte, 2011). None of these studies, however, have extended their analyses to determine the impact of these differential employment outcomes *on government finances*. In the present study, we aim to fill this gap.

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Unpaid caregiving can impact government expenditures in several ways. First, the above highlighted employment effects can impact government income tax revenues to the extent that unpaid caregiving drives down the incomes and employment rates of more intense caregivers relative to non-caregivers. Further, if there are lower labour force participation rates among caregivers, unpaid caregiving can have an impact on social assistance payments. As a benefit to government, unpaid caregiving can also act as a substitute for some paid government caregiving (Bonsang, 2009), thus potentially reducing public home care costs.

The purpose of this study was to conduct an economic evaluation of unpaid caregiving in terms of the costs and effects, strictly from a public payer perspective. Specifically, we compared the net benefit/cost of different intensities of caregivers relative to non-caregivers aged 45 and over taking into consideration differential tax revenues, social assistance payments, and paid care services. We conducted this analysis in the Canadian context, where, at the time in question, there were more than 2 million informal caregivers (CIHI, 2010). Levels of publicly supported home care services vary dramatically across the country due to a decentralized system of provincial financing and delivery. Aside from the tax credits available to caregivers from the federal government, there is little hands-on support provided to caregivers directly via the provincial health care systems (Lilly, Robinson, Holtzman, & Bottorff, 2012). Given this relatively minimal direct support for caregivers, we considered a scenario whereby the primary consequences to government resulted from the labour force effects of caregiving and government funded paid care for care recipients. Such an analysis should be of interest to policy makers who are considering extending caregiver benefits, as it provides a measure of the policy impact on government budgets.

Methods

We conducted a cost-benefit analysis of unpaid caregiving. Our analysis followed the Canadian Agency for Drugs and Technologies in Health (CADTH) economic evaluation guidelines where appropriate (CADTH, 2006). The target population was families who received paid and/or unpaid caregiving. The alternative interventions were unpaid caregiving and government paid caregiving. We took a government perspective, where we consider the provincial and federal governments combined. The timeline was over a one year period, specifically 2007; hence, no discounting was conducted. All analysis and interpretation were conducted in 2011 and using STATA/SE version 11.

Data and sample

We used the Canadian 2007 General Social Survey (GSS) to conduct our analysis. The GSS is an annual, nationally representative survey of community-dwelling adults aged 45 and over, designed to gather information on social trends and socio-economic well-being. The dataset is publicly available; however, key variables relating to individuals' wages were only available for analysis through a Statistics Canada Research Data Centre. Ethical approval for the study and for access to restricted data was obtained through the University of Toronto Research Ethics Board. The 2007 GSS cycle gathered specific information on unpaid caregiving and care receiving. When these caregiving data are combined with detailed demographic and employment information included in the main survey, the GSS forms the richest source of data on both labour supply and caregiving for a cross-section of Canadians. The 2007 GSS interviewed approximately 23,000 Canadians, focussing only on individuals aged 45 and over. While this captures the majority of caregivers in Canada, the exclusion of those under age 45 limited our ability to analyse the influence of caregiving on younger labour force participants. The 2007 Labour Force Survey (LFS) and Survey of Labour and Income Dynamics (SLID) were used to assign costs to avoided paid care expenditures and social assistance payments respectively.

We began our analysis with a brief descriptive overview of the potential labour force participant (i.e. caregivers and non-caregivers under age 65) and care recipient (i.e. individuals who had received paid or unpaid care in the previous 12 months) samples. These samples respectively formed the basis of our labour force outcomes and paid care analyses.

Costing methods

Below we provide an overview of how we calculated the yearly costs (income tax revenues and social assistance payments) and benefits (paid care expenditures) for different intensity caregivers relative to non-caregivers. We provide a schematic overview of our costing methods in Table 1.

Income tax revenues

The first cost we considered was the difference in income tax revenues due to potentially lower labour force outcomes of caregivers versus non-caregivers. Caregivers in the GSS were defined as individuals who provided unpaid assistance to a family member or friend with a long term disability or physical limitation in the previous 12 months. Assistance with the following activities was included in the definition: personal care, house maintenance, transportation, banking, health services, and care management. Based on findings from Lilly et al. (2011), we categorized caregiving by intensity using the weekly hours of care that a caregiver provided. We considered caregivers providing less than 5 h of weekly care as

Table 1
Overview of costing methods.

Cost of government paid home care	− (Lost income tax revenues	+ Social assistance payments)
Probability of receiving paid care (Probit multivariate using GSS)	Probability of labour force participation (Probit multivariate using GSS)	Probability of receiving social assistance (Weighted proportions using GSS)
× Weekly hours of paid care (Two-stage multivariate Heckman model using GSS)	× Wage rate (Two-stage multivariate Heckman model using GSS)	× Social assistance payment rate (Age and sex adjusted from LFS)
× Average personal support worker wage (Using SLID estimates)	× Hours worked (Selection corrected OLS using GSS)	× Number in caregiving group (Using GSS population weights)
× Proportion of government funded care (Using OHCA estimates)	× Weeks worked (Weighted proportion using GSS)	
× Number in caregiving group (Using GSS population weights)	× Number in caregiving group (Using GSS population weights)	

the least intense, followed by those providing 5–9.9, 10–14.9, and 15 or more hours of weekly care respectively. We estimated three separate regression equations to quantify the propensity of labour force participation, the hourly wage, and the weekly hours of employment of each intensity caregiver relative to non-caregivers.

A summary of the statistical methods and data source for each of these steps is provided in the second column of Table 1. First, a probit equation was estimated to determine the probability of labour force participation, while ordinary least squares equations were estimated to determine the values for the predicted wage and weekly hours of employment. In all of our models, we assumed that unpaid care was exogenous, due to the lack of a strong instrument. To correct for potential selection bias in the wage equation, we employed Heckman's two-stage estimation technique (Heckman, 1974). We included the error term residuals from the wage equation in our hours of work equation to correct for potential selection bias (Lilly et al., 2010). In all of our equations, we controlled for a number of demographic characteristics (age, education, marital status, presence of children at home, region of residence), health characteristics (self-rated health, presence of a disability), socio-economic characteristics (presence of other income), and caregiving intensity (number of weekly caregiving hours). We note that in alternate specifications of our labour force participation regression, we controlled for the level of household income and obtained coefficients of similar magnitude and significance for the caregiving variables. Due to the high number of missing observations for household income, we chose to use the presence of other income to proxy alternate income sources. We estimated separate equations for male and female caregiver samples due to the significant differences between the sexes in our descriptive analysis.

Based on our regression results, we estimated predicted values for labour force participation, wage, and hours of work for each intensity level caregiver versus non-caregivers, multiplying these predicted values together to obtain predicted weekly incomes. We then determined a predicted yearly income for each caregiver sub-group and for non-caregivers by multiplying the weekly income by the weighted average number of weeks worked for each sub-group. We applied an implicit tax rate based on 2007 Statistics Canada estimates (Statistics Canada, 2010). We used the implicit tax rate for all family types combined, adjusting the rate based on the income quintiles into which each sub-group fell. Finally, we compared the tax revenue from each caregiver sub-group to non-caregivers.

Social assistance payments

In the third column of Table 1, we summarized the statistical methods and data sources for costing social assistance payments for each of our sub-groups. Given the limited number of individuals in the GSS who received social assistance, we could not perform multivariate analysis to determine the probability of receiving social assistance. Instead, the probability of receiving social assistance payments was estimated by taking the weighted proportions of individuals receiving social assistance payments as their main source of income for each of the non-caregiver and caregiver intensity sub-groups (<5 h; 5–9.9 h; 10–14.9 h; and 15+ h). Age and sex-specific estimates of mean social assistance payments from the Survey of Labour and Income Dynamics were used to calculate the cost to government for these payments. Again, we took the difference between each caregiver intensity group and the non-caregiver group to determine the relative cost for each group.

Government transfers

We determined the total yearly cost for each caregiver intensity sub-group by adding the difference in tax revenues for each caregiver group (relative to non-caregivers) to the difference in social assistance payments for each caregiver intensity sub-group (relative to non-caregivers).

Differences in government paid assistance

Using the GSS care recipient sub-sample (aged 45 and over), we applied multivariate analysis to determine the impact of receiving different intensities of unpaid assistance on the propensity to receive any paid assistance and on the hours of paid assistance received. In the first column of Table 1, we outlined the statistical methods and data sources used. We defined care recipients as those who received either paid care, unpaid care, or both. The care recipient sample was used in order to control for care recipient health status – an important determinant of whether an individual receives paid care, and which was not available in the caregiver data modules. In our final model, we controlled for health status with a health utility index variable which allowed for negative values. In alternative specifications, we also controlled for self-rated health and various chronic conditions with similar results. The use of the care recipient sample enabled recipients of only paid care to be used as a base case comparator for the different intensities of unpaid caregiving, which was also not possible with the caregiver modules.

Similar to our labour force outcomes equations, we considered care recipients receiving less than 5 h as the least intense, followed by those receiving 5–9.9 h of care, 10–14.9 h of care, and 15 or more hours of care. We hypothesized that paid and unpaid care would be substitutes to each other, as most of the tasks in the GSS definition of unpaid care required a lower skill level (i.e. household maintenance, transportation, domestic duties, and scheduling). However, we note that the GSS definition of unpaid care also includes medical assistance and personal maintenance, which require a higher level of skill and, therefore, could lead to a complementary relationship between paid and unpaid care (Bonsang, 2009). Due to the lack of a strong instrument, we assumed that unpaid care was exogenous in our regression models, despite the likelihood that paid and unpaid care are simultaneously determined (Bonsang, 2009; Charles & Sevak, 2005; Van Houtven & Norton, 2004). We discuss the implications of this assumption in the Discussion section.

To correct for potential selection bias in our hours of paid care equation, we again applied Heckman's two-stage estimation technique (Heckman, 1974). We considered a number of demographic (sex of care recipient, sex of primary caregiver conditional on having a caregiver, marital status, age, rural residence, and years of education), health status (health utility index), socioeconomic (employment status of care recipient, employment status of primary unpaid caregiver conditional on having a caregiver), and unpaid caregiving (availability of family/friends to assist respondent and weekly number of unpaid caregiving hours) characteristics. Predicted values were obtained separately for care recipients whose primary caregivers were male versus female.

Based on our regression results, we estimated the probability that care recipients would receive paid assistance and, if positive, the average hours of paid assistance received. These estimates were determined for care recipients receiving each intensity level of unpaid care relative to those who received only paid care. From these estimates, we determined the predicted yearly hours of paid care for each care recipient sub-group, assuming 52 weeks of care. We then applied an hourly total cost of employment based on 2007 Labour Force Survey estimates of the hourly wage of home support workers in Canada ($14.67). Applying Hollander et al. (2008) estimation techniques to the hourly wage from the LFS, we took into account employment benefits, sick days and holidays, administration, and other overheads. This entailed increasing the hourly wage by a factor of 1.8 to $26.41.

Population level estimates

Costs

Using the population weights from the GSS, we determined the approximate population size for each of the sub-groups of non-caregivers and different intensity caregivers between the ages 45 and 64. We then multiplied the individual annual costs due to the differential labour force outcomes by the estimated size of each sub-population. The caregiver sub-samples did not have hours of unpaid care observations for approximately 8% of individuals who self-identified as caregivers. As such, to ensure that the four caregiver intensity sub-groups totalled to the actual caregiver population, we estimated the intensity sub-group population sizes by multiplying the total caregiver population by the proportion of individuals at the population level within each caregiver intensity sub-group. As with the individual level estimates, the population level costs for each sub-group of caregivers were measured relative to non-caregivers.

Benefits

Using the population weights from the GSS, we determined the approximate population size for each of our sub-groups of care recipients aged 45 to over 80 who receive no unpaid care and care recipients who receive different intensities of unpaid care from male caregivers and female caregivers. For the care recipient sample, approximately 20% of individuals who self-identified as unpaid care recipients did not have observations for the hours of unpaid care received. As such, the population sizes for these groups were estimated using the same approach as the labour force outcomes analysis. The population level costs for each sub-group of recipients who received unpaid care were measured relative to the group of recipients who did not receive any unpaid care (i.e. received only paid care).

Sensitivity analysis

One-way sensitivity analysis was applied for cost and benefit components that were uncertain, could be calculated in different ways, or that varied significantly across provinces to determine the impact on net benefits. We varied the method with which predicted values were estimated using the whole sample mean, as opposed to conditional sub-group means; the implicit tax rate based on the provinces with the lowest (Prince Edward Island) and highest (Quebec) implicit tax rates for 2007; and the hourly wage of home support workers based on the provinces with the lowest (Newfoundland) and highest (British Columbia) mean hourly wages in 2007.

We also applied one-way sensitivity analysis to ascertain how different our estimates would be using a friction-cost approach. In place of the weighted average number of weeks worked to calculate lost income tax revenue, we used Statistics Canada data to determine the average yearly duration of unemployment for Canadian men and women over age 45. While an imperfect proxy for the friction period, we compared these duration of unemployment figures with a Dutch study (Tan, Bouwmand, Rutten, & Hakkaart-van Roijen, 2012) calculating the friction period in Holland when the Dutch unemployment rate (5.5%) was similar to Canada's unemployment rate in 2007 (6.0%). We found these figures (24.2 weeks for men over 45 and 20.2 weeks for women over 45) to be comparable to the Dutch estimate of the friction period (23 weeks). Given the significant changes in the labour market since 2007, where unemployment was at a decade-low in Canada, we also included in our sensitivity analysis a friction-cost estimate that utilizes the duration of unemployment from the decade's highest unemployment rate (8.3%) in 2009.

Results

In Table 2, we present demographic and socioeconomic characteristics for all potential labour force participants aged 45 and over by caregiving status, including the results of *t*-tests and chi-square tests comparing these sub-samples. Overall, we found that both men and women averaged 54 years of age, lived in households with less than three people and did not have children below the age of 15. The majority of men (83.1%) and women (73.2%) were married, with at least some college education, though caregivers tended to have higher levels of education than non-caregivers. Men in the sample had significantly higher personal incomes than women ($65,227 versus $35,667), and caregivers had higher personal and household incomes than non-caregivers. Men were around 15

Table 2
Descriptive statistics for caregivers versus non-caregivers, men and women analysed separately.

	Men							Women						
	All		Non-Caregivers		Caregivers		Sig	All		Non-Caregivers		Caregivers		Sig
	Mean/%	SE	Mean/%	SE	Mean/%	SE		Mean/%	SE	Mean/%	SE	Mean/%	SE	
Age	53.5	0.025	53.5	0.054	53.6	0.117		53.5	0.020	53.5	0.059	53.6	0.092	
# Children <15	0.3	0.009	0.3	0.011	0.3	0.017		0.2	0.006	0.2	0.007	0.1	0.139	
# Household members	2.9	0.018	2.8	0.022	2.9	0.038		2.6	0.015	2.6	0.021	2.6	0.026	
Married	81.8%	0.005	81.2%	0.006	83.1%	0.009		74.1%	0.005	74.6%	0.007	73.2%	0.009	
Years of education	14.3	0.020	14.1	0.025	14.5	0.036	***	3.3	0.018	14.2	0.022	14.5	0.027	***
Personal income	$65,227	1029	$63,920	1238	$68,284	1869		$35,667	574	$33,757	745	$38,722	902	***
Household income	$75,049	501	$73,633	622	$78,381	866	***	$66,779	454	$65,481	602	$68,857	690	***
Other income	64.0%	0.007	64.0%	0.008	64.0%	0.013		79.5%	0.005	79.8%	0.006	79.1%	0.008	
Employed	81.5%	0.005	81.6%	0.006	81.3%	0.010		70.9%	0.005	70.5%	0.007	71.7%	0.009	
Retired	12.1%	0.004	11.4%	0.005	13.8%	0.008	*	14.1%	0.004	13.2%	0.005	15.6%	0.007	**
Visible minority	10.0%	0.004	11.8%	0.006	6.4%	0.008	***	8.5%	0.003	12.5%	0.006	3.9%	0.005	***
Region														
Maritimes	7.7%	0.000	7.7%	0.002	7.7%	0.004		7.8%	0.000	8.1%	0.002	7.3%	0.003	
Quebec	24.7%	0.001	26.2%	0.004	21.0%	0.010	***	24.8%	0.001	25.2%	0.004	24.3%	0.007	
Ontario	37.4%	0.001	36.4%	0.005	40.0%	0.011	*	37.8%	0.001	37.1%	0.005	39.0%	0.008	
Prairies	16.3%	0.001	15.9%	0.003	17.3%	0.007		15.8%	0.000	15.7%	0.003	16.0%	0.005	
British Columbia	13.8%	0.001	13.7%	0.003	14.0%	0.008		13.8%	0.001	14.0%	0.003	13.4%	0.006	
N	6663		4737		1926			8243		5199		3044		

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$.

Table 3
Descriptive statistics for recipients versus non-recipients of unpaid care.

	All		Unpaid recipients		Non-recipients		Sig
	Mean/%	SE	Mean/%	SE	Mean/%	SE	
Sex (female = 1)	60.3%	0.010	63.4%	0.010	49.3%	0.03	***
Age	64.5		64.1	0.256	66.1	0.525	**
Any children <15	8.66%	0.008	9.30%	0.009	6.34%	0.015	
Married	56.5%	0.012	55.9%	0.014	58.5%	0.023	
Years of education	13.1	0.085	12.9	0.097	13.6	0.165	***
Personal income	$33,191	809	$31,599	928	$39,103	1671	***
Other income	63.2%	0.011	64.6%	0.013	58.2%	0.023	**
Employed	29.4%	0.011	29.6%	0.013	28.8%	0.024	
Retired	45.5%	0.012	43.4%	0.014	53.0%	0.026	**
Visible minority	4.0%	0.006	4.4%	0.007	2.9%	0.009	
Health utility index	0.60	0.010	0.57	0.010	0.70	0.01	***
Rural location	37.6%	0.011	38.6%	0.012	33.9%	0.024	*
Paid care recipient	70.8%	0.011	62.6%	0.014	100.0%	0.000	***
Region							
Maritimes	8.2%	0.004	8.7%	0.005	6.7%	0.009	*
Quebec	26.6%	0.010	24.4%	0.012	34.5%	0.026	***
Ontario	37.0%	0.011	37.6%	0.013	34.6%	0.025	
Prairies	15.0%	0.007	15.8%	0.008	12.1%	0.014	*
British Columbia	13.2%	0.008	13.5%	0.009	12.1%	0.016	
N	2354		1851		503		

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$.

percentage points less likely than women to have an alternate source of income, and the majority of both men (81.3%) and women (71.7%) were employed. Similar proportions of men and women had retired (12.1% and 14.1%). Overall, visible minorities were less likely to be caregivers.

In Table 3, we present a similar descriptive summary of the care recipient sample, which includes *t*-tests and chi-square tests comparing recipients of unpaid care with recipients of only paid care. On average, recipients who received unpaid care were more likely to be female and were two years younger than those who did not receive unpaid care. Care recipients were unlikely to have children under the age of 15 and typically lived in households with less than three members. The percentage of married care recipients was low (56.5%), likely because of the relatively high proportion of care recipients who were widowed (26.5%). Overall, care recipients had lower incomes and lower rates of employment, with 29.4% of the sample indicating they were currently employed. Those who received only paid care had higher incomes and a lower likelihood of having another income source. Care recipients indicated a much lower health status than the overall sample, and those receiving unpaid care had a lower health status than those who received only paid care. Approximately 71% of the entire sample received paid care, and most of those receiving unpaid care (62.6%) also received paid care.

Table 4
Predicted values to determine lost income tax revenues, men and women caregivers.

	Employment probability	Hourly wage	Weekly hours worked	Weeks worked annually
Men				
Non-caregivers	0.87	$29.52	41.40	48.32
Caregivers (<5 h)	0.88	$33.50	41.12*	48.85
Caregivers (5–9.9 h)	0.91	$28.29	41.93	48.72
Caregiver (10–4.9 h)	0.88	$25.95*	41.54**	48.94
Caregivers (15+ h)	0.68**	$29.06	40.98	48.60
Women				
Non-caregivers	0.74	$22.61	34.10	47.79
Caregivers (<5 h)	0.79	$26.17	34.68	47.75
Caregivers (5–9.9 h)	0.74	$26.48**	34.51	46.52
Caregiver (10–4.9 h)	0.78	$25.76	32.64	47.62
Caregivers (15+ h)	0.63***	$23.78	33.78	45.08

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$.

Table 5
Weighted proportions and means to determine annual social assistance payments, men and women caregivers.

	Proportion receiving social assistance	Mean yearly social assistance payment
Men		
Non-caregivers	0.10	$7615.35
Caregivers (<5 h)	0.06	$7676.13
Caregivers (5–9.9 h)	0.07	$7696.13
Caregiver (10–4.9 h)	0.17	$7816.46
Caregivers (15+ h)	0.11	$7638.21
Women		
Non-caregivers	0.11	$8295.51
Caregivers (<5 h)	0.05	$8466.31
Caregivers (5–9.9 h)	0.05	$8281.14
Caregiver (10–4.9 h)	0.07	$8596.98
Caregivers (15+ h)	0.08	$8317.15

In Tables 4–6, we present the predicted values used in each of our costing steps. Where multivariate analysis was conducted, we indicate which of the caregiving sub-groups had a statistically significant association with the outcome variable relative to non-caregivers. Table 4 demonstrates that the driving force behind differences in yearly income tax revenues was the significantly lower labour force participation rates of high intensity caregivers. The differences in employment probability between other caregiver sub-groups and non-caregivers were not substantial, nor statistically significant. Even when there were significant associations between the wages and hours worked and being a higher intensity caregiver, the effect was small.

In Table 5, we show the weighted proportions of each sub-population receiving social assistance. Overall, we see that more intense male caregivers had a higher proportion of individuals receiving social assistance. This was not the case amongst women. All caregiving groups had lower proportions of individuals receiving social assistance. For both men and women, we see very few differences in the levels of social assistance payments between the caregiving groups.

Finally, Table 6 demonstrates the predicted values for the probability of receiving paid care and the hours of paid care received for care recipients of different intensities of unpaid care. There was a statistically significant effect for the lowest and highest intensity caregivers. Generally, as the intensity of unpaid care increased, so too did the probability of receiving paid care. We also found that there was a significantly higher number of paid care hours provided to those receiving the highest intensity of unpaid care.

The above described predicted values were used to determine the individual level estimates of each intensity caregiver relative to

Table 6
Predicted values to determine annual government paid care expenditure, men and women care recipients.

	Probability of paid care	Hours of paid care
Men		
No unpaid care	0.95	5.70
<5 h unpaid care	0.53*	2.88*
5–10 h unpaid care	0.54	6.45
10–15 h unpaid care	0.62	4.97
15+ h unpaid care	0.45*	11.37*
Women		
No unpaid care	0.95	5.70
<5 h unpaid care	0.61*	4.38*
5–10 h unpaid care	0.59	9.03
10–15 h unpaid care	0.74	8.06
15+ h unpaid care	0.58*	12.89*

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$.

non-caregivers, which we outline below. In Fig. 1, we provide a summary of the individual level estimates of government costs for male caregivers (lost tax revenues plus social assistance payments) and benefits (reductions in government paid assistance). For lower intensity caregivers, we found that the yearly income relative to non-caregivers was actually higher and the likelihood of receiving social assistance was lower, resulting in a lower cost relative to non-caregivers. However, a significant cost arose from the higher intensity caregivers – providing more than 15 h of weekly care was associated with a $2054 reduction in per capita government revenue relative to non-caregivers, all other factors considered equal. Overall, at the two lowest intensity levels, government revenues from caregivers were higher relative to non-caregivers. Meanwhile, at the highest caregiving intensity levels, revenues were smaller.

With regard to benefits, contrary to our hypothesis that paid and unpaid care would be substitutes, our predicted results are more in line with a complementary relationship. As shown in Table 6, the hours of paid assistance increased with hours of unpaid assistance. This positive relationship between paid and unpaid care hours implied an associated decline in benefits to government as the level of unpaid care increased. There was still, however, a positive benefit no matter how intense the level of caregiving, with the greatest benefit arising at the lowest intensity of caregiving ($2951) and the lowest benefit when the intensity was highest ($218). For all caregiver intensity sub-groups, unpaid caregiving was associated with a reduction in government supported paid care relative to those receiving no unpaid care.

At the individual level there was a steep decline in net benefits as the intensity of caregiving increased. This decline was driven by both the decreasing benefits of more intense caregivers and by the increasing cost of more intense caregiving. The net benefit was positive for low to mid intensity caregivers, but became negative at the most intense level of caregiving (−$1836).

In Fig. 2, we see a similar outcome for women, with a cost line that increases as intensity of caregiving increases. However, we found that relative to non-caregivers, the labour force outcomes for women were higher until the most intense level of caregiving. Only once a woman provided 15 or more weekly hours of care did her total yearly earnings become lower than non-caregivers. All women who provided caregiving at any intensity were *less* likely than non-caregivers to receive social assistance, and so the negative social assistance costs actually detracted from the overall costs of caregiving at all caregiving intensities. Due to the counter-effect of the negative social assistance costs and the lower earnings of women in the sample, we found that the cost of high intensity caregiving was less than a quarter of the cost for high intensity caregiving men ($483).

As with recipients who had male caregivers, benefits to government associated with recipients who had female caregivers declined as caregiving intensity increased. However, unlike recipients with male caregivers, recipients with female caregivers

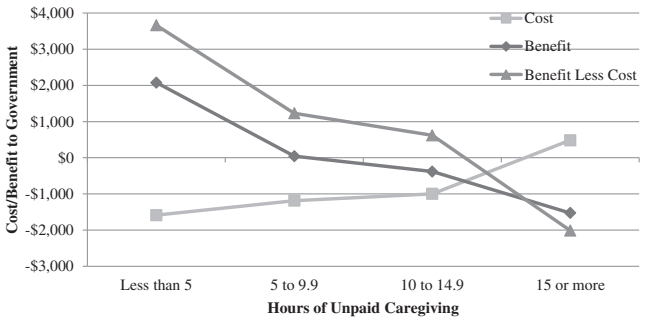

Fig. 2. Estimated individual level costs and benefits of different intensity caregiving relative to non-caregivers in 2007 Canadian dollars, female caregivers.

experienced negative benefits when 10 or more hours of unpaid care were provided. This finding was likely due to the weaker impact of unpaid care on the probability of receiving paid care for recipients with female caregivers relative to those with male caregivers. At the lowest intensity, we found that recipients who received less than 5 h of unpaid care accrued a benefit of $2075 relative to those who received no unpaid care. However, at the highest intensity, the benefit was negative relative to recipients who received no unpaid care.

The combination of the increasing costs and decreasing benefits again resulted in a declining net benefit of unpaid caregiving as intensity increased. The decline was less steep than with the male caregivers and remained positive until the highest intensity of caregiving. However, this positive net benefit was largely attributable to the better labour market outcomes of lower intensity caregivers.

When we consider the population level estimates for men, we see the strong effect that the sub-population sizes have on both relative costs and benefits (Fig. 3). Taking into account how few caregivers actually fell into the "intense" categories, the overall cost at the highest intensities ($159 million and $325 million) was more than offset by the more substantial negative costs at the lower caregiving intensities (−$1.6 billion and −$97 million).

A very similar pattern emerged among women, with the results for female caregivers presented in Fig. 4. At the lowest intensity, there was an almost identical cost of −$1.6 billion for women. However, despite the population of very high intensity female caregivers being almost double that of the male population, there remained a significantly lower overall cost associated with high intensity caregiving for women ($177 million for women). This difference was probably driven by the fact that higher intensity caregiving men were more likely to receive social assistance than higher intensity caregiving women and because of the lower yearly incomes of women.

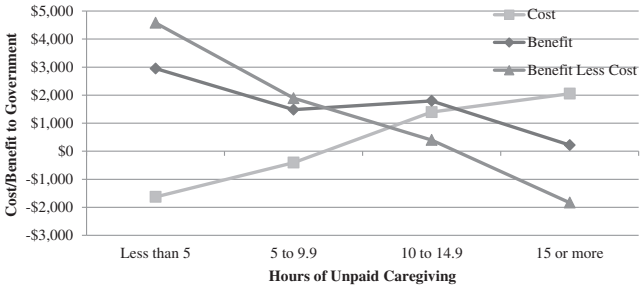

Fig. 1. Estimated individual level costs and benefits of different intensity caregiving relative to non-caregivers in 2007 Canadian dollars, male caregivers.

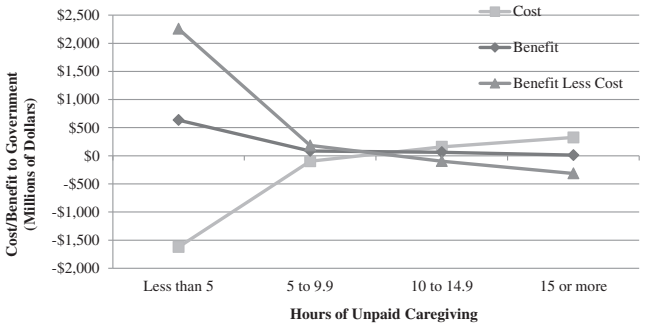

Fig. 3. Estimated population level costs and benefits of different intensity caregiving relative to non-caregivers in 2007 Canadian dollars, male caregivers.

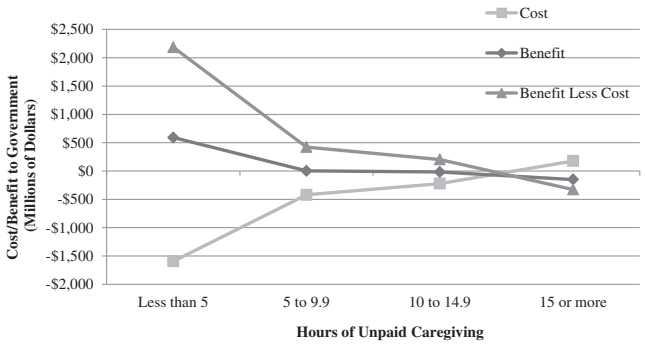

Fig. 4. Estimated population level costs and benefits of different intensity caregiving relative to non-caregivers in 2007 Canadian dollars, female caregivers.

Sensitivity analysis

Below, we briefly summarize findings from our sensitivity analysis (not shown). We compared the net benefit of the individual level estimates. Our first variation in the sensitivity analysis was to calculate the predicted values for the probability of labour force participation, wages, hours of work, probability of paid care, and hours of paid care using the sample means, as opposed to subgroup means. The adjusted net benefits were generally lower at the sample mean. While the overall trend remained similar, men providing 10–14.9 h of unpaid care were especially sensitive to this alternative method of calculation. The net benefit decreased from $1835.32 to −$125.91 for men and increased from $313.05 to $1288.58 for women at the individual level.

When we altered the tax rate according to the provinces with the highest and lowest implicit tax rates, there was limited variation in the overall net benefit calculation. It is likely that the range of tax rates was not wide enough to cause a large shift in income tax revenues. However, we found a strong effect on the overall net benefit when we varied the home support worker wages. The range in the wages was quite large (from $9.44 to $17.01), resulting in a generally lower net benefit for the lower wage and a somewhat higher net benefit when the support worker wages were higher.

The most significant variation in our estimates came from using a friction cost approach. As would be expected, decreasing the number of weeks of lost income tax revenue from around 48 to 24 for men and from around 47 to 21 for women substantially impacted our net benefit calculations. While the overall trend remained the same, in that there remained a consistent net benefit for lower intensity caregivers and a net cost for our highest intensity caregivers, the magnitude of these estimates was substantially smaller. At the population level, for instance, the overall net benefit of lower intensity caregiving using the friction cost method was $1.8 billion annually, compared with our base case estimate of $4.4 billion (i.e. 59% smaller than the base case) and the net cost for high intensity caregivers was $321 million versus the base case of $641 million (i.e. 50% smaller than the base case). Using alternate friction costs estimates from 2009, resulted in similar estimates to the 2007 figures, at $1.9 billion benefit for low intensity caregivers and $344 million cost for high intensity caregivers.

Discussion

In this study, we have assessed some of the major costs and benefits of unpaid caregiving in Canada from a government perspective. In particular, we have analysed how, and quantified the extent to which, income tax revenues and social assistance payments to caregivers are impacted by unpaid caregiving through changes in labour market outcomes. We have also quantified the extent to which unpaid caregiving can impact the cost to government of providing paid assistance to care recipients. We consistently found that at the lowest level of caregiving intensity, there is a net benefit to government from caregiving. Meanwhile, at the highest level of intensity, there is a consistent net loss to government. These two findings remained stable across all of the variations in our sensitivity analysis. Given the robustness of these findings, we can be quite confident that a net benefit and a net cost are experienced respectively at low and high intensities of unpaid care.

The exact magnitudes of our estimates are specific to the 2007 Canadian context in that they reflect Canadian income tax rates and social assistance payments. However, our results indicate that the primary cost driver of the highest intensity caregivers is their lower labour force participation rates. This implies that our finding of a higher cost for high intensity caregivers could be generalizable to other international contexts where this association has been found. Based on findings in Europe (Carmichael & Charles, 2003; Crespo, 2007; Drinkwater, 2011; Hassink & Van den Berg, 2011; Heitmueller, 2007), North America (Pyper, 2006), and Australia (Berecki-Gisolf et al., 2008), it is likely that similar analyses could also conclude that there is a net cost to governments of high intensity caregiving in these contexts.

In addition, given that the unemployment rate in Canada at the time of data collection was very low, the cost to government related to high intensity caregiving (accompanied by lower labour force participation) was relatively high. Since the economic downturn of 2008–2009, unemployment has increased slightly and it could be argued that high intensity caregiving has become less expensive to government. We view this as a temporary condition – for Canada and other economies including Europe – given the increasingly tight labour market conditions that will be associated with population ageing and large-scale waves of retirement. Thus, we can only expect the economic losses to government associated with high intensity caregiving to increase if informal care continues to be associated with lower rates of labour force participation.

Throughout our analysis, we made a number of assumptions that impacted our results. We first consider the exogeneity of unpaid care in our labour force outcomes analysis. In assuming that causality runs in the direction of unpaid care to labour force outcomes, one would be apt to conclude from our results that lower levels of unpaid care *lead to* better labour force outcomes and, therefore, higher tax revenues and lower social assistance payments for the government. However, the more likely explanation is that causality runs in both directions. For instance, we may merely have captured the likelihood that people in occupations with more flexibility are able to take on lower intensity caregiving due to the nature of their jobs. Previous work by Lilly et al. (2011) has shown that caregivers more often worked in managerial and professional occupations, which often provide this flexibility. These individuals would also be more likely to have higher labour force outcomes. We also note inconsistent findings in previous literature regarding the effect of assuming exogeneity on unpaid care estimates. Crespo (2007), for instance, concludes that assuming exogeneity underestimates the effect of unpaid care on labour force participation (i.e. implying a higher costs for our most intense caregivers), while Heitmueller (2007) finds the opposite (i.e. implying smaller costs). In the latter case, however, the author notes that the bias for higher intensity caregivers, which is the only group for which we found a significant negative effect, is likely to be very small. As such, our exogeneity assumption implies that any bias would lead to a very slight over-estimation or else an under-estimation of our high intensity caregivers' net cost relative to other caregiver groups.

Our assumption of exogeneity in the paid care equations could also have implications for our cost estimates. Our initial assumption was that a substitution relationship would exist, as has been found in previous studies that corrected for endogeneity (Charles & Sevak,

2005; Van Houtven & Norton, 2004). Our regression results, however, pointed to a complementary relationship, as paid care probability rose with unpaid care hours. If, in line with findings from Van Houtven and Norton (2004) and Charles and Sevak (2005), our positive association was an artefact of our exogeneity assumption, we would expect our net benefits to be higher than estimated. However, it is also possible that the attributes of our sample led to this finding. Bonsang (2009) and Bolin, Lindgren, and Lundborg (2008) both found that when the type of care provided involved a higher skill level (i.e. doctor or nursing care), unpaid and paid care are more likely to have a complementary relationship and exogeneity is less likely to be rejected. In our sample, further analysis revealed that the most common type of care provided was medical care, compared to other lower skill tasks (e.g. house maintenance). It is possible that the higher needs of our care recipient sample are driving this positive association between paid and unpaid care. As we could not differentiate the hours of care relating to higher intensity tasks versus lower intensity tasks, it is difficult to determine the extent to which endogeneity is a concern in this sample (Bonsang, 2009).

We also note that our findings are relevant only to caregivers over the age of 45, implying that our cost estimates do not include costs of younger caregivers. We do note, though, that those over the age of 45 comprise the majority of caregivers in Canada and are the most likely to adjust their labour force participation for caregiving (Lilly, Laporte, & Coyte, 2007). We also did not include all conceivable costs and benefits in this analysis. Potential health benefits or costs, for instance, were not considered due to the cross-sectional nature of the data. If paid care and unpaid care were substitutes, the net benefit would be underestimated by the omission of health outcomes; however, as our results seem to indicate that paid care and unpaid care are complements to each other, the effect of this omission could be to actually inflate the net benefit. Further, costs to government that could arise due to the potentially detrimental effects of caregiving on caregivers' health were not considered (Earle & Heymanne, 2011; O'Reilly, Connolly, Rosato, & Patterson, 2008). When longitudinal data of this nature is available in Canada, solutions to these shortcomings can be explored.

Finally, we should consider how some of our methodological decisions affected our results. The use of statistically non-significant regression coefficients in our analysis implies that we should interpret the findings of these sub-groups with caution. In particular, the sub-groups with smaller samples sizes (those providing/receiving 5–9.9 h of unpaid care and 10–14.9 h of unpaid care) were often statistically non-significant in our regressions. It is possible that the relatively smaller number of individuals falling in these categories contributed to the statistical non-significance of these variables.

Conclusion

The implications of even these preliminary findings should be of interest from a government perspective. We can now assign a rough value of the total cost of high intensity caregiving (those providing 15 or more weekly hours of care) of around $641 million per year. As this appears to be the only intensity group causing a net loss to government, this would appear to be the one group towards which policy development could be considered.

We noted earlier that the driving force behind this loss to government was the much lower labour force participation rates of these caregivers. Though some would argue that those who are unemployed are more inclined to take on a caregiving role, the results from previous work by Lilly et al. (2011) did not support the idea that labour force non-participants self-selected into unpaid caregiving. As such, we can conclude that policies that are aimed at helping caregivers retain their employment could help to reverse these costs. More specifically, promoting workplace flexibility could be particularly beneficial – for caregivers, government, and employers who all experience losses resulting from the difficulties in balancing employment with caregiving.

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